



Technology Development and Transfer Office *John C. Stennis Space Center*

THE DOLPHIN

Integrated Optical System for Synoptic Remote Sensing Validation



The Dolphin

A small self-contained, integrated sensor system designed for rapid optical surveying and real-time realization of advanced data products, the DOLPHIN was developed by WET Labs of Philomath, OR, under a Small Business Innovation Research (SBIR) contract with NASA's Stennis Space Center in South Mississippi. The DOLPHIN, or Diving OpticalL Profiler and High-speed Integration Network, is the first development of its kind to integrate a platform, sensors and software. This packaging allows multi-parametric data collection and assimilation in time and space scales for rapid in-situ surveys of the waters. The three key elements that make the DOLPHIN unique are its towed optical and hydrographic instrumentation package, the automated data integration, processing and visualization network, and a discrete sampling system designed to continuously pump water from the towed package to the boat for analysis.

The DOLPHIN is a first of its kind package designed to vastly simplify sampling for coastal, ocean color remote sensing calibration efforts and in algorithm development for obtaining biogeochemical parameters from remote measurements. The innovation in this package is that it effectively integrates a platform, sensors and software to allow multi-parametric data collection and assimilation in time and space scales that allow rapid in-situ surveys of the waters.

HOT Points

- **Integrated platform, sensors and software package**
- **Towed optical and hydrographic instrumentation package**
- **Automated data integration, processing and visualization network**
- **Discrete sampling system**
- **Real-time path from measurement to data product**
- **Price tag of around \$100,000**

The DOLPHIN contains three key system components that allow this to happen. The first is a towed optical and hydrographic instrumentation package. The package is towed behind a small research vessel to maximize spatial coverage. This provides a continuous set of calibration points for validation instead of a single of stationary point that is typically obtained from a ship. The second component is the automated data integration, processing and visualization network. This real-time network saves the research community substantial time and money. A third key element is a discrete sampling system designed to continuously pump water from the towed package to the boat for analysis. This allows sample collection for direct laboratory analyses of biochemical parameters needed in validation and algorithm development work.

WHY THE DOLPHIN IS IMPORTANT

The DOLPHIN was developed because of the need in the remote sensing arena of an integrated, optical sampling system capable of rapid surveys to validate remote sensing data. The goal of the system is to provide optical data sets ideally suited for fulfilling calibration and validation needs for NASA remote sensing applications, including aircraft-based and future space-based lidar technologies.

The DOLPHIN as an integrated systems provides savings in time and resources in allowing the user a direct path from measurement to data product in real-time or near real-time. When compared to more typical turnaround time for collection and processing of data, which often ranges from six months to more than a year, the savings and subsequent improved capabilities prove dramatic.

With six months to go in the Phase II SBIR contract, WET Labs has constructed two systems that are undergoing testing and refinement. The visual interface and data emerging components of the final software component are nearing completion. WET Labs is already reaping the benefits of this successful technology, even before it has hit the market. The company has added to its facility, doubling its production and engineering workspace, and has purchased a sea-going boat capable of testing large towed packages in coastal waters. It has also added two jobs, including hiring Dr. Andrew Barnard, who was overseer of the GOMOOS moorings in the Gulf of Maine.

CURRENT USES

The NASA Earth Science Enterprise at Stennis Space Center is anxiously awaiting its first system to be used by Dr. Richard Miller to collect data needed to develop applications for remote sensing technologies in the coastal waters of the Gulf of Mexico.

TARGET MARKETS

But NASA is not the only group that will benefit from use of the DOLPHIN. Wet Labs President Casey Moore sees the systems being used by scientists and resource managers who conduct coastal surveys of the water at major university oceanography programs and other government agencies. The price tag of around \$150,000 per system makes the DOLPHIN an economical option with considerable savings in resources for data collection and processing compared to conventional methods with stationary ship vertical profiling systems.

The DOLPHIN has immediate commercial applications in the areas of oceanography and limnology. It also is ideally designed for validating bio-optical algorithms for obtaining biogeochemical properties from water-leaving radiance in coastal waters. According to Moore, the package also has the potential to be used to track fresh water in-flows, to map dispersion of point sources of nutrients, hydrocarbons and other pollutants, and as a tool for tracking HAB blooms over time horizontal extent and vertical depth. Its design also opens doors for use with future remote sensing technologies such as space-based lidar systems, and for applications in riverine and lacustrine systems.

FUTURE OF THE DOLPHIN

Moore said WET Labs plans to have the DOLPHIN on the market by early 2004 in two forms, as the entire package and as core acquisition components for real time, multi-parameter data collection on other platforms. In the meanwhile, WET Labs will continue its software refinements and will be updating its machine shop equipment to allow for more economical construction of hardware components.

WHY SBIR?

SBIR is a highly competitive multi-phase program that provides small U.S. businesses with federal funds reserved for conducting serious research and development. Phase I is the start-up segment with awards up to \$70,000; if chosen, Phase II awardees are granted up to \$600,000 to conduct research and development for two years. The SBIR Program at Stennis Space Center is managed through the Technology Development and Transfer Office. For more information regarding the NASA Small Business Innovation Research Program contact the Technology Development and Transfer Office at Stennis Space Center at (228) 688-1929 or visit our website at <http://technology.ssc.nasa.gov>.

To find out more information about the DOLPHIN, contact WET Labs at (541) 929-5650 or visit their web site at www.wetlabs.com.

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